ROCKY MOUNT
PUBLIC UTILITIES

NATURAL GAS

FREQUENTLY ASKED QUESTIONS

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NATURAL GAS FACTS

What is Natural Gas?

Natural gas is an odorless, colorless, non-toxic, non-corrosive and shapeless gas in its pure form. It is a mixture of hydrocarbon gases that is primarily formed of methane. Natural gas has a high energy density, meaning its unique, natural properties allow it to work harder and more efficiently with less waste.

How is Natural Gas formed?

Natural gas is a fossil fuel like oil and coal. There are three processes through which fossil fuels can be created: thermogenic, biogenic and abiogenic.

The first and most widely accepted theory as to the origin of fossil fuels is the Thermogenic Process. This theory says fossil fuels are formed when organic matter (such as the remains of a plant or animal) is compressed under the earth at very high pressure for a long time.

The biogenic process can also form natural gas. Methanogens are tiny methane producing microorganisms that chemically break down organic matter to produce methane. Usually, methane formed in this manner is produced close to the surface of the earth and is lost in the atmosphere. However, methane formed from methanogens can be trapped underground and recovered as natural gas. Landfill gas is an example of biogenic methane.

The third way natural gas is produced is through the abiogenic process. Deep in the earth's crust, there are hydrogen rich gases and carbon molecules. As these gases rise towards the surface of the earth, they interact with other minerals found underground in the absence of oxygen. If these gases are under high pressure as they rise to the surface of the earth, they form methane gas, which can result in natural gas deposits.

Where can Natural Gas be found and how much exists?

The majority of the natural gas consumed in the United States is produced domestically. Some natural gas is imported from Canada and shipped to the United States in pipelines. In the United States, natural gas reservoirs are concentrated in Texas, in and around the Gulf of Mexico, and the nation's mid-section.

In addition to the proven reserves available, there are also large volumes of on-shore-undiscovered recoverable natural gas, such as shale gas. The majority of shale gas in the United States is located in and around the Appalachian Basin.

What is Liquefied Natural Gas (LNG)?

Liquefied Natural Gas (LNG) is natural gas converted to liquid by cooling the gas to -260° for storage and transportation purposes. LNG is mainly used for transporting natural gas to markets where it is regasified and distributed as pipeline natural gas. LNG is comparable in density to gasoline or diesel fuel and produces less pollution. The high cost associated with production and storage of LNG has prevented its widespread use in commercial applications.

What is Shale Gas?

Shale gas is defined as natural gas produced from shale formations. Shale acts as the source and reservoir for natural gas. Shales are formed from the mud of very shallow seas that existed over 350 million years ago. It is a very fine-grained sedimentary rock easily broken into thin, parallel layers. In order for shale to produce gas, it must be rich in organic materials, and they must be located in areas where high heat and pressure have converted petroleum to natural gas. The shale must also be brittle and rigid enough to maintain open fractures in order to retrieve the gas.

How is Natural Gas transported and stored?

Transportation

The transportation system consists of an intricate system of pipelines designed to deliver natural gas effectively and efficiently to its point of delivery in areas of high demand. If the amount of gas delivered is not needed, it can be put in storage facilities for later use. Rocky Mount does not have such storage facilities.

There are three types of pipelines along the transportation system: the gathering system, the interstate system, and the distribution system.

The gathering system consists of low pressure, low diameter pipelines transporting raw natural gas from the wellhead to the processing plant.

The interstate system is made up of high-pressure pipelines. The high pressure acts as a propellant to move the natural gas through the pipeline. Pipelines can be characterized as being interstate or intrastate. Interstate pipelines carry natural gas across state lines while intrastate pipelines transport natural gas within a particular state.

The distribution system delivers natural gas to cities and towns within a particular area. This is the final step in natural gas delivery to the end user. Distribution involves moving smaller amounts of natural gas at much lower pressures over shorter distances to a larger number of individual customers.

Transco transports the City's natural gas from the wellhead to Piedmont Natural Gas. Piedmont Natural Gas transports the natural gas to the City's gate stations, where it is then transported to individual customers via the City's distribution system.

Storage

Natural gas can be stored for an indefinite amount of time. Because natural gas is not always needed immediately, it is stored in underground storage facilities. It is common for these storage facilities to be located near markets without a ready supply of locally produced natural gas.

Natural gas is stored for two main reasons: meeting seasonal demand and as insurance against unforeseen supply disruptions. Generally, natural gas is injected into base load storage facilities during the summer months when heating demand is low (April-October) and is withdrawn from storage during winter months to meet the increased heating demand (November-March).

Peak load storage facilities are intended to meet sudden, short-term demand requirements.

Natural gas can be stored in three types of underground storage: depleted gas reservoirs, aquifers, and salt caverns.

The most common form of underground storage facilities are depleted gas reservoirs, which are formations that have been tapped of all of their recoverable natural gas. Aquifers are underground porous, permeable rock formations that act as natural water reservoirs. Salt caverns are well suited to natural gas storage because they allow little gas to escape from the formation. The walls of a salt cavern have the structural strength of steel, making them resilient against reservoir degradation.

Why choose Natural Gas?

Natural gas can be used for heating, water heating, drying clothes, cooking, and fireplaces, among other uses. With natural gas, customers enjoy efficient heating, instant hot water, and precise cooking temperatures.

There are other benefits of using natural gas. For instance, more than 80% of the natural gas used in the U.S. is produced domestically. Also, service is less vulnerable to storms and extreme weather because natural gas is delivered via an underground distribution system. Natural gas is always available; which means customers will not run out, and there is no need for a storage tank.

In addition to being reliable, natural gas is also efficient. Approximately 92% of the natural gas produced at the wellhead is delivered to customers as usable energy. Also, homes using natural gas appliances use 28% less energy than similar homes using all electric appliances, according to the American Gas Association.

Another benefit of using natural gas is a reduced carbon footprint. Homes using natural gas appliances have approximately 46% less carbon footprint than homes using electricity generated from coal and 30% less than fuel oil. Natural gas radiant heat and fireplaces also improve the air quality in the home by cutting down on dust and allergens.

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NATURAL GAS USAGE

What are the residential uses of Natural Gas?

In the early days of the natural gas industry, it was mainly used to light streetlamps and the occasional home. However, with the development of distribution channels and technological advancements, natural gas is being used in ways never thought possible.

Natural gas is used to produce steel, glass, paper, clothing, brick, and electricity. Some products use natural gas as a raw material including paints, fertilizer, plastics, antifreeze, dyes, photographic film, pharmaceuticals, and explosives. Natural gas is also used in homes for heating systems, stoves, water heaters, clothes dryers, and other household appliances.

According to the American Gas Association (AGA), Natural gas furnaces and boilers used for home heating are up to 96% efficient. Natural gas heating systems emit 40% less carbon emissions than electric heat pumps and all but eliminate sulfur oxide emissions.

Natural gas heats water twice as fast as a standard electric water heater, making it a much more efficient fuel choice. Because natural gas water heaters are so efficient, they emit up to half the carbon emissions of an electric water heater, making it an environmentally friendly choice, as well.

Tankless water heaters are even more efficient. A conventional water heater continues to heat water stored in a tank even when it is not needed. By heating water only when it is needed, tankless water heaters reduce stand-by energy loss from unused water left to cool in the tank. They also last twice as long as conventional water heaters.

Natural gas provides precise, even, and efficient cooking temperatures and provides instant heat for cook tops, ovens, ranges, and grills. Additionally, natural gas appliances are ideal during power outages because the natural gas is supplied by pipelines underground; therefore, service is far less likely to be interrupted during storms or severe weather.

Using natural gas patio heaters can extend the outdoor season by providing heat year round. Natural gas grills provide the opportunity to cook outdoors, which can help reduce cooling costs during the warm summer months. Also, there's no need to refill tanks because natural gas grills are connected directly to the gas line. Natural gas fireplace sets and inserts eliminate messy wood and ash of a traditional fire pit or campfire. Natural gas is a clean, efficient, and cost effective option for pool heating, as well.

Natural gas dryers work by moving warm air through the clothes. On average consumers can dry two loads of clothes in a natural gas dryer for the same amount of money it costs to dry just one load in an electric dryer, according to the American Gas Association.

Natural gas can be used as fuel for back-up generators for residential and industrial purposes. For many homes and businesses, natural gas generators provide peace of mind by operating automatically in the event of a power outage. Natural gas generators also emit far less greenhouse gases than gasoline or diesel-powered generators.

What are other uses of Natural Gas?

Natural Gas Fuel Cells

Natural gas fuel cells have the ability to generate electricity using electrochemical reactions as opposed to combustion of fossil fuels to generate electricity. Fuel cells produce very low levels of harmful emissions and generate high quality, reliable electricity. They are available in compact sizes, allowing them to be used wherever electricity is needed. Fuel cells can be used in residential, commercial, industrial, and transportation applications. The use of fuel cells is expected to change the way electricity is generated in the coming years.

Natural Gas Vehicles (NGVs)

A natural gas vehicle or NGV is an alternative fuel vehicle using Compressed Natural Gas (CNG) as a clean alternative to other automobile fuels. Existing gasoline-powered vehicles can be converted to allow the use of CNG. According to Natural Gas Vehicles for America, there are about 50 different manufacturers in the U.S. that produce 100 models of light-, medium-, and heavy-duty natural gas vehicles and engines. The natural gas-powered Honda Civic Natural Gas has been recognized by the U.S. Environmental Protection Agency (EPA) as the cleanest commercially available, internal-combustion vehicle.

The use of NGVs faces several limitations, including fuel storage and available infrastructure for delivery and distribution at fueling stations. Natural gas must be stored in cylinders and these cylinders are typically located in the vehicle's trunk. The location of the storage cylinder reduces the space available for other uses.

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NATURAL GAS AND THE ENVIRONMENT

Why is Natural Gas considered a 'clean' burning fossil fuel?

Natural gas is the cleanest burning of all fossil fuels. Because natural gas is composed primarily of methane, the main bi-products of natural gas are carbon dioxide and water vapor. In contrast, when coal and oil are burned, higher levels of harmful emissions are released including nitrogen oxide and sulfur dioxide. Coal and oil also release ash particles when burned. Ash particles are carried into the atmosphere and contribute to air pollution. When natural gas is burned, much smaller amounts of sulfur dioxide, carbon monoxide, nitrogen oxide, and carbon dioxide are released. There are virtually no ash particles associated with the burning of natural gas.

Can Natural Gas be used as an alternative energy source?

Because natural gas is such an environmentally friendly fuel, it is being used more frequently as an alternative fuel source, particularly in electric generation. Natural gas can be used in a variety of applications on a small or large scale. Natural gas generators are used at homes and businesses as backup power or to reduce load during peak hours. Natural gas is also used as an alternate fuel source to generate electricity at large power plants. Vehicles fueled by natural gas are an emerging technology helping to lower fuel emissions.

What are the environmental advantages to using Natural Gas?

The environmental benefits of natural gas include fewer impurities and less pollution when burned due to a chemically complex structure. Because natural gas releases fewer impurities, it addresses a number of environmental concerns such as smog, acid rain, gas emissions, and lowering individual carbon footprints.

How is Natural Gas extracted?

Geologists use seismic surveys to locate potential natural gas deposits. Seismic surveys use echoes from a vibration source to collect information about the rocks below. Dynamite can be used to provide the necessary vibration. Once a team of geologists and geophysicists has identified a potential natural gas deposit, drilling experts dig down to where the natural gas is thought to exist.

Once drilling begins and the presence of natural gas is detected, it is termed a productive well. At this point, the well is completed and natural gas production can proceed. If there is not a marketable amount of natural gas present, the well is termed a dry well.

After a determination has been made as to whether or not there is a marketable amount of natural gas present, the next step is to extract the gas from the ground, by means of on-shore or off-shore drilling, and process it for transportation.

What is the difference between on-shore and off-shore drilling?

On-shore drilling refers to the discovery and development of natural gas resources lying under the Earth's surface. Off-shore drilling refers to the discovery and development of natural gas resources located underwater, most commonly in the world's oceans. Off-shore drilling can also apply to drilling in lakes and inland seas.

The drilling techniques used to penetrate the sea floor are very similar to those used in on-shore drilling. However, drilling at sea poses a different set of challenges than on-shore drilling. With on-shore drilling, for instance, the Earth's surface provides the platform from which to drill. The sea floor, however, can be hundreds or thousands of feet below the surface; therefore, an artificial platform must be constructed. Also, the environment is more remote and harsh on off-shore drilling rigs. Because off-shore rigs are located in deep water, the ocean increases the pressure on the drilling equipment and increases the amount of energy required to move sand from the sea floor. Off-shore facilities also experience logistical and human resources challenges.

Why is off-shore drilling a controversial subject?

Part of the debate stems from the differing amounts of natural gas estimated to exist along the outer continental shelf (OCS). There is debate as to what impact, both economically and environmentally, any off-shore oil or natural gas reserves might have.

Drilling supporters contend increasing domestic production along the coast of the United Sates would lower prices and reduce the nation's reliance on foreign oil resources. Those against off-shore drilling argue any oil or natural gas found would have minimal impact on prices or domestic supplies and would have a devastating environmental impact.

Drilling proponents feel that legalizing off-shore drilling could help the global market lower its prices. Economists argue the United States would have to make a substantial addition to the global production of oil and natural gas in order to make an impact on the price.

The most notable risks with off-shore drilling are the potential environmental consequences. Off-shore drilling involves the same risks as drilling on-shore, except that it's being done hundreds, sometimes thousands of feet under water. When oil and natural gas are recovered from the sea floor, toxins such as mercury, lead, and arsenic may be released into the ocean. Seismic equipment using sonar technology to locate oil and natural gas deposits may disorient whales and cause them to become beached. Transporting oil and natural gas may also pose a threat to the ecosystem. Oil spills from oil tankers, pipelines, and leaks from accidents on the platform can all have consequences on marine life and the coastal environment.

What is Hydraulic Fracturing?

Natural gas has been produced from shale formations for years through natural fractures. However, recent advances in drilling technologies have made it possible to create artificial fractures in the shale formation. Hydraulic fracturing, also known as hydrofracking or fracking, is the most common technique to stimulate the shale formation to retrieve the natural gas.

Hydraulic fracturing is the process of injecting "fracking fluids" under high pressure into the rock formations where natural gas resources are located. The pressure from the fluids creates fractures in the rock, allowing the trapped natural gas to flow up out of the ground where it can be collected. The fracking fluids consist of 90% water, 9.5% sand, and 0.5% chemicals. The sand is used to keep the fractures in the rock open so the gas can escape. According to EnergyAnswered.org, the chemicals can vary from well to well but basically consist of a mix of common industrial and household materials. An example of such materials used in hydraulic fracturing is guar, an emulsifying agent found in ice cream.

Shale gas will play a major role in future natural gas production in the United States. Shale gas tends to cost more to produce because of the expense of hydraulic fracturing and horizontal drilling required. However, recent horizontal drilling and hydraulic fracturing techniques have been developed making shale natural gas an economically viable alternative to conventional natural gas resources.

Can Natural Gas be a renewable resource?

Natural gas can be considered a renewable source of energy depending on how it is produced. Because natural gas is primarily composed of methane, and methane is readily available and accessible from numerous sources, it can be considered renewable. Methane is created from organic matter during decomposition.

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NATURAL GAS SAFETY

Is Natural Gas safe?

Natural gas is one of the safest forms of energy available. Based on information from the American Gas Association (AGA), between 1986 and 2004, more than 650,000 miles of pipeline were added to the nation's natural gas distribution system. During the same time, the number of reportable incidents on distribution lines DECREASED by 28%.

According to the National Transportation Safety Board, in 2002, there were only 12 fatalities associated with natural gas pipelines. In contrast, there were more than 42,000 transportation fatalities and another combined 2,000 fatalities for boating, aviation, and railroads.

Why does Natural Gas have an unpleasant odor?

Natural gas in its natural state is an odorless substance. Natural gas distributors add a natural, harmless chemical called mercaptan, which gives natural gas its distinctive odor. The "rotten egg" odor is added as a way to detect the presence of natural gas or a potential gas leak in order to help keep customers safe.

What are the warning signs of a Natural Gas leak?

When used properly, natural gas provides customers with clean, reliable, efficient, and safe energy. It is important to understand how to detect a natural gas leak and the proper steps to take to remain safe. The following are signs of a potential natural gas leak:

- The strong smell of "rotten eggs"
- A shrill blowing or hissing sound
- Dirt blowing up from a hole in the ground
- Vegetation over or near a pipeline appears dead or discolored
- Persistent bubbles in streams, ponds, or wet areas

What should customers do if a Natural Gas leak is suspected?

Customers who suspect they may have a natural gas leak should leave immediately, go to a neighbor's home, and call (252) 467-4800 day or night at the first sign of gas leak. An electric spark could cause an explosion; therefore, customers should not smoke, strike a match, operate any electrical switches or appliance controls, pull any plugs from outlets, use a flashlight or lighter, or use a telephone or cell phone inside the building.

When should customers call 811?

811 is a federally-mandated national "Call Before You Dig" number that was created to protect customers from unintentionally hitting underground utility lines while working on digging projects. Customers should always call 811 before beginning any project that involves digging. In addition to natural gas lines, electrical, telephone, cable, water, sewer, and fiber optic lines can be buried underground. Knowing where underground utility lines are buried before digging will protect customers from injury and prevent damages to utilities, service disruptions and potential fines and

repairs. Whether planting a tree or shrub, or installing a deck or pool, every job that involves digging requires customers call prior to digging. The depth of utility lines varies and there may be multiple utility lines in one common area.

811 can be dialed from anywhere in the country and the call will be routed to the local One Call Center. Customers will need to explain the scope and location of the project to the operator. The One Call Center will notify the member utility companies to dispatch a locator to mark the approximate location of any underground lines, pipes, and cables.

What are Carbon Monoxide hazards?

Carbon monoxide is an odorless, colorless, and tasteless gas lighter than air. High levels of carbon monoxide can be fatal. Carbon monoxide is a toxic gas produced when fuels such as gasoline, oil, propane, kerosene, coal, wood, and natural gas do not have an adequate supply of oxygen to burn completely. When carbon monoxide is inhaled, it combines with the body's blood and prevents it from absorbing oxygen. Symptoms of carbon monoxide poisoning include severe headaches, nausea, vomiting, and sleepiness. There is usually no fever associated with carbon monoxide poisoning.

Common sources of carbon monoxide poisoning include:

- Malfunctioning heating equipment
- Blocked chimney
- Indoor use of barbecue grills
- Using cooking appliances for heating purposes
- Sitting inside an idling vehicle for a prolonged period of time
- Repairing or running engines, such as vehicles, lawnmowers and snow blowers, in an attached garage

To prevent potential carbon monoxide poisoning, customers should have their heating and hot water equipment and venting systems inspected annually by a qualified technician. Safe natural gas equipment should show a clear blue flame. A yellow or orange flame may indicate a problem. Carbon monoxide detectors should be installed throughout the home to monitor the presence of carbon monoxide before it reaches dangerous levels.

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NATURAL GAS MARKET REGULATION

Who regulates the Natural Gas market?

The federal government regulated the natural gas market in 1938 with the Natural Gas Act as a reaction to possible abuses, such as price gouging, and the rising prominence of natural gas consumers. The Natural Gas Act was intended to restrict and regulate the price of natural gas as a way to protect consumers; however, natural gas shortages during the 1970s and 1980s indicated a regulated market was not good for consumers or the natural gas industry.

A gradual shift towards a deregulated market during the late 1980s and 1990s allowed for more competition resulting in a healthier market, lower prices for consumers, and the discovery of more natural gas.

Today the Federal Energy Regulatory Commission (FERC) regulates the natural gas market. Although FERC does not exclusively deal with the natural gas industry, it is the primary rule-making body for the industry.

Because the natural gas industry is not as strictly regulated as before, natural gas is being delivered to customers more efficiently, effectively, safely and more economically than ever before.

What are the barriers to increasing the Natural Gas supply?

Natural gas is a vital source of energy for the nation's economy. Maintaining an adequate supply is extremely important. Ideally, there would be a minimal amount of time between increased demand for natural gas and an increased supply reaching the market. Realistically, there are barriers to immediate supplies, which can affect the short-term availability of natural gas.

From 1991 to 1999, relatively low prices indicated an adequate supply of natural gas. As a reaction to lower prices, the exploration and production industry slowed down significantly. Some workers left the industry rather than remain unemployed. Natural gas prices began to rise in late 1999. The need for trained and skilled workers slowed the increase in exploration and production activity. To counter the problem, many production companies began to offer higher wages, scholarships, and educational contributions to attract professionals to the industry.

Price instability on the market makes it difficult for production companies and equipment suppliers to plan the construction and placement of drilling rigs far in advance. Periods of low prices result in a reduction of the number of available drilling rigs. When prices begin to rise, drilling activity increases, which requires time to build and place an adequate number of rigs to meet the increased demand.

Exploration activities must take place to locate natural gas reserves before drilling can begin. Once a natural gas reserve has been located, the production company must receive the required approval from the landowner. The Bureau of Land Management issues permits for on-shore drilling and the Minerals Management Service is responsible for off-shore drilling. The timeframe from when natural gas resources are located to when production begins can range from just a few months to ten years.

Weather patterns can have a significant impact on natural gas production. Hurricanes, for example, can have a major impact on the off-shore production of natural gas. Safety measures

require the temporary shutdown of off-shore drilling and production when a hurricane is approaching. Delivery disruptions can also interfere with the production and delivery of natural gas. For example, a compressor malfunction on a large pipeline serving a large market could disrupt the flow of natural gas to that area.

The Federal Government owns almost 30% of the land area of the United States. According to NaturalGas.org, an estimated 59% of U.S. undiscovered natural gas resources can be found on federal lands and off-shore waters. However, these resources are inaccessible for exploration and production due to government restrictions.

The intrastate and interstate pipeline infrastructure is essential to natural gas supplies and delivery. Without it, natural gas could not reach the end user. The pipeline can only transport so much natural gas at one time, which creates a ceiling for how much natural gas can reach the market. Natural gas pipeline companies must continue to expand the pipeline grid in order to meet the growing demand.

In 1999, the National Petroleum Council estimated production companies would have to invest $1.44 trillion between 1999 and 2015 to meet the growing demand. This puts significant pressure on production companies, especially small, privately-owned companies. The rate production companies are able to produce enough capital to increase production can be an obstacle to increasing natural gas supplies.

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CITY OF ROCKY MOUNT'S NATURAL GAS SYSTEM

How did the City of Rocky Mount get into the Natural Gas business?

The completion of federal government pipelines during World War II for the transport of petroleum products east from Texas, Oklahoma, and Louisiana to the Mid-Atlantic States created a pipeline construction boom during postwar years. The opening of rich natural gas fields in coastal Texas and Louisiana after the war made billions of cubic feet of clean burning natural gas available to customers on the East Coast.

In 1957, North Carolina Natural Gas Company of Fayetteville announced that its pipeline across eastern North Carolina would stretch north from Greene County to Roanoke Rapids and pass just east of Rocky Mount. The City of Rocky Mount quickly decided to connect to the North Carolina Natural Gas Pipeline.

The City's manufactured gas system had served the City since 1912 when the first gas mains were constructed. However, manufactured gas had drawbacks for a modern industrial society. Manufactured gas had a much lower BTU (British thermal unit) rating than natural gas, and it was suitable only for residential cooking and heating purposes. Manufactured gas also had to be stored in telescoping gas holders, which were only capable of holding a few days' supply.

With natural gas promising more BTUs and more residential applications, it was a good choice as an added product for consumers. In 1958, the City of Rocky Mount signed a contract with a consulting engineering firm from Raleigh to draw plans and specifications for the conversion of the City's manufactured gas system to a natural gas system.

On March 2, 1959, the voters of Rocky Mount overwhelmingly approved $600,000 in bonds to convert the City's manufactured gas system to a natural gas system. During the summer of 1959, crews began to convert thousands of gas appliances for the use of natural gas. Because of the difference in BTUs and pressure, burner tips on every gas appliance in the city had to be changed. At the same time, the City gas crews laid new high-pressure mains throughout Rocky Mount.

It was a huge undertaking but was accomplished on time and within budget. Natural gas flowed into the City's mains in November 1959, opening a new era of utility service for Rocky Mount residents.

How large is the City of Rocky Mount's Natural Gas system?

As of June 2013, the City of Rocky Mount has the following:

Number of meters	16,974
Mcfs sold (1 Mcf=1000 cubic feet)	1,679,308
Miles of distribution mains	526
Miles of service lines	307

How does the City of Rocky Mount purchase its Natural Gas?

The City of Rocky Mount purchases natural gas on the open market each month. In addition to paying for the cost of the gas, the City of Rocky Mount pays to have it transported from production areas, such as the Gulf of Mexico, to the City's system via interstate and intrastate pipelines.

Natural gas is a commodity traded on the open market like wheat, oil, and lumber. Commodity markets are inherently volatile because they are based on supply and demand. Market factors determine the wholesale price of natural gas. There are distinct types of natural gas markets: the spot market and the futures market.

The spot market is the daily market, where natural gas is bought and sold 'right now.' To get the price of natural gas on a specific day, the spot market is the most reliable resource. The futures market consists of buying and selling natural gas under contract anywhere from 1 month to many years in advance. Natural gas futures are traded on the New York Mercantile Exchange (NYMEX).

Natural gas marketing—the process of coordinating, at various levels, the business of bringing natural gas from the wellhead to end-users—has become an integral component of the natural gas industry. The City of Rocky Mount utilizes the services of Texican Horizon Energy Marketing, which is an affiliate of Texican Natural Gas Company, the largest natural gas supplier to industrial, commercial, and municipal customers in the Carolinas.

The job of a natural gas marketer is to find buyers for natural gas, ensure secure supplies in the market, and provide a pathway for natural gas to reach the end-user. The marketer also ensures market transparency by arranging transportation, storage (if necessary), accounting, and any other step required to facilitate the sale of natural gas.

What is the Purchased Gas Adjustment (PGA)?

Natural Gas is a commodity that is traded on the open market; therefore, the price of natural gas is dependent upon supply and demand.

The City of Rocky Mount purchases natural gas on the open market. In addition to paying for the cost of the gas itself, the City also pays to have it transported. Therefore, the City's natural gas rates are set using a base rate that accounts for transportation, commodity and utility costs. The rates are then adjusted each month based on the fluctuating commodity price of the gas itself.

The rate mechanism for adjusting for the fluctuation in the price of natural gas is known as the Purchased Gas Adjustment (PGA). The City of Rocky Mount does not profit from these fluctuations in gas costs. Instead, all costs associated with increases or decreases in the commodity price of natural gas are passed along to customers. For example, in June 2013 the PGA was -$0.30. This reduced the residential gas sales rate for the first 10 therms/customer from $1.52709 to $1.22709 and the rate for over 10 therms/customer from $1.32709 to $1.02709 per therm.

(See City of Rocky Mount Natural Gas Rate Schedule)

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CITY OF ROCKY MOUNT'S NATURAL GAS RATES

How are Natural Gas rates determined?

Natural gas rates are set using a base rate that accounts for transportation, operations and maintenance costs of the gas system, then adjusted each month based on the fluctuating price of the gas itself. The City of Rocky Mount does not profit from fluctuations in gas costs. All costs associated with increases or decreases in the commodity price of natural gas are passed along to customers.

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(See City of Rocky Mount Natural Gas Rate Schedule)

How are operating costs for Natural Gas appliances determined?

Natural gas appliances have a BTU rating, which represents the amount of gas consumed in a one-hour period. Natural gas meters read usage in CCFs, but the customer is billed in therms. One therm equals 100,000 BTUs.

To calculate how much an appliance will cost per hour to run, simply multiply the BTU rating by the current natural gas rate and divide by 100,000. For example, using the June 2013 natural gas rate of $1.02709 per therm, it would cost $0.31 per hour to use an appliance with a rating of 30,000 BTUs.

How are Natural Gas costs calculated for the monthly utility bill?

To estimate the cost of natural gas usage in the home, first determine the usage by subtracting the previous meter reading from the current after a certain amount of time. For example, if the previous meter reading is 5429 and the current is 5480, the usage would be 51 CCF for that time period.

The usage is measured in CCFs (volume) but billed in therms (heat factor). To convert the usage from CCFs into therms, the City of Rocky Mount must first multiply the usage by the pressure factor and therm factor.

The cost would then be calculated as below using a pressure factor of 1.000, a therm factor of 1.0147, and the following June 2013 rates with a -$0.30 PGA: $1.22709 for the first 10 therms and $1.02709 for the remaining therms.

5480 - 5429 = 51 CCF (gas usage)

51 CCF (usage) X 1.000 (pressure factor) = 51

51 X 1.0147 (therm factor) = 51.7497

$1.22709 X 10 = $12.27 (for the first 10 therms)

51.7497 - 10 = 41.7497(remaining therms)

41.7497 X $1.02709 = $42.88

$12.27 + $42.88 + $9.00* = $64.15

*Monthly $9.00 facilities charge

Some customers receive natural gas at a higher pressure and a pressure factor must be applied when calculating their bill. This is to ensure that their gas usage is properly measured. The pressure factor varies per customer because it depends on the delivery pressure, which is determined by the type of meter index -- i.e. the row of dials (analog) or numbers (digital). For most new meters, a pressure factor is used to adjust the usage measurement.

The "Multiplier/Factor" on the utility bill is the therm factor. Similar to the pressure factor, the therm factor is used to adjust the usage measurement to ensure an accurate reading. Natural gas is measured in CCFs but billed in therms. A therm factor is necessary to convert the CCFs to therms for billing purposes. The therm factor is applied to all natural gas customers' utility bills. The value of the therm factor changes annually.

How does Natural Gas compare to propane in cost and efficiency?

Natural gas and propane are very similar in their uses. Both are well suited for heating, cooking and gas logs. The City of Rocky Mount measures natural gas in therms. Most propane companies measure their product in gallons. As indicated in the chart below, there are more BTUs per therm of natural gas than there are in the same amount of gallons of propane. Therefore, customers get the same amount of heating capacity using less natural gas than propane. For example:

Number of gallons of propane used in the past 12 months	1,000
Cost per gallon of propane (as of June 2013)	$2.099
Annual cost of propane	$2,099.00
Equivalent therms of natural gas	916
Current price per therm of natural gas	$1.02709
Estimated annual cost of natural gas	$940.81
Estimated annual savings using natural gas	**$1,158.19**
NOTE: T*he price of natural gas and propane is subject to change monthly.*	

Residential Annual Energy Cost Comparison				
	Home Heating	**Water Heating**	**Clothes Drying**	**Cooking**
Natural Gas Residential Cost*	**$719**	**$308**	**$55**	**$44**
Propane Cost at $2.099 per gallon	$1,604	$686	$124	$99
Electric Residential Cost*	$960	$737	$125	$92
*City of Rocky Mount facility costs per month are not included in the individual end-use costs. NOTE: *Actual savings may vary depending on energy costs, size and design of structure, number of residents, efficiency of equipment, and usage.*				

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CITY OF ROCKY MOUNT'S NATURAL GAS SERVICES

What Natural Gas services are provided by the City of Rocky Mount?

The City of Rocky Mount provides a complete package of services in order to make connection to natural gas as convenient as possible.

The City of Rocky Mount will install up to 100 feet of service line for the first natural gas appliance at no charge to the customer. If needed, an additional 25 feet of gas service line will be provided for each additional natural gas appliance. Any additional footage will be installed at a cost of $5.00 per foot to the customer. A gas division representative is available to offer estimates at no charge to the customer.

Upon release from inspections of all inside piping and appliance connections, a gas crew will install the customer's gas meter by connecting the service line into the appliance line at no charge to the customer.

The gas division responds immediately to all emergency calls. Emergencies include: gas leaks in or around a home or business; ruptured gas lines; storm related damages; and fire.

Are there any incentives available for having Natural Gas installed?

The City of Rocky Mount offers a Natural Gas Incentive Program to encourage area builders, developers, homeowners, or general contractors to install natural gas heating systems, water heaters, ranges, and clothes dryers in new construction for residential, commercial, and industrial buildings outside the City's electric territory. Customers converting or replacing an appliance from an energy source other then the City's electric system, such as propane, are also eligible. New construction also includes additions and expansion projects which add new space to an existing structure.

What rebates are available through the Natural Gas Incentive Program?

The following chart lists the various types of rebates available, depending on the type of equipment installed:

Condition for Incentive	Equipment	Incentive
Installation in combination with Natural Gas as the primary heating source	Natural Gas water heater	$300
New installation, conversion, or replacement	Natural Gas clothes dryer	$50
New installation, conversion, or replacement	Natural Gas cooking range	$50
Conversion or replacement from an existing fuel	Natural Gas heating system	$100
Conversion or replacement from an existing fuel	Natural Gas water heating	$200
Total potential earnings per building:		**$400**

Note: *The installation of a natural gas heating system and water heater is NOT a condition for receiving either one or both of the available $50 rebates.*

How do customers apply for the Natural Gas Incentive Program?

Customers must first submit an application prior to the installation of the eligible equipment. Applications may be submitted online at www.rockymountnc.gov/utilities/builders.html or by calling (252) 972-1269.

The application form does not guarantee incentive payment, but informs the City of Rocky Mount of the customer's intent to install qualifying equipment. The installation of eligible natural gas equipment will be verified at the time the gas division sets the gas meter. The meter can only be set after all natural gas equipment installations pass the required local inspection process. Once the meter is set and the eligible natural gas equipment installation is verified, the incentive payment check to the customer will be processed.

How do customers get Natural Gas installed at a home or business?

Whether installing new service or converting existing appliances, there are several steps to getting natural gas installed. Customers should first decide if they would be purchasing new appliances or converting existing appliances.

In order for natural gas to be available to a home or business, there must be a gas main in close proximity. A service line can then be run to a home or building.

For assistance with the application process, customers should contact Customer Service in person, by phone, or online. Information such as name, address, telephone number, and social security number will be required for the application. Commercial and industrial customers also need to provide information about the anticipated load.

Once the application is complete, Customer Service will forward the application to the gas division.

A gas division representative will contact the customer to schedule a time to visit the property. The gas division will determine where the service meter site will be located. All underground utilities must also be located before a gas line can be installed. An approximate installation date may be set at this point. Gas division service workers will be on site to dig a trench and install the underground line on the specified date.

Is it possible to convert existing appliances to natural gas?

Many appliances can be converted from another fuel source to natural gas by using a conversion kit. However, some appliances cannot be converted or are too expensive to convert. Customers should contact a licensed mechanical contractor to evaluate the pros and cons of converting existing appliances or purchasing new ones.

Customers are responsible for the conversion or installation costs, which are based on time and materials (labor, parts, and materials, permit costs, etc.). Customers should evaluate the economic feasibility of converting existing appliances or purchasing new ones.

Does the City of Rocky Mount convert appliances?

No, this is not a service that is offered. Customers will need to contact a licensed contractor for conversion and installation.

Does the City of Rocky Mount install gas lines from the meter to the appliances?

No, customers should contact a licensed contractor to have gas lines installed from the gas meter to any appliances.

Are permits required for the installation of Natural Gas services?

Yes, a mechanical permit is required for installing natural gas appliances. Either the customer or the contractor may obtain the permit. The cost for the permit varies according to the work being done.

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GLOSSARY OF TERMS

(IN ALPHABETICAL ORDER)

Abiogenic Process

Deep in the earth's crust there are hydrogen rich gases and carbon molecules. As these gases rise towards the surface of the earth, they can interact with other minerals found underground in the absence of oxygen. The interaction of these gases may result in a reaction that forms elements and compounds that are found in the atmosphere (nitrogen, oxygen, carbon dioxide, argon and water). If these gases are under high pressure as they rise to the surface of the earth, they are likely to form methane gas, which can result in natural gas deposits.

Aquifers

Aquifers are underground porous, permeable rock formations that act as natural water reservoirs. Typically, these storage facilities are only used in areas where there are not any available depleted reservoirs nearby. Aquifers are the most expensive and time-consuming type of underground storage because they require more exploration and the capacity of the reservoir is unknown.

Base Load Storage Facilities

Base load storage facilities hold enough natural gas to maintain long term seasonal demand requirements and provide a steady supply.

Biogenic Process

Methanogens are tiny methane producing microorganisms that chemically breakdown organic matter to produce methane. Usually, methane formed in this manner is produced close to the surface of the earth and is lost in the atmosphere. However, this methane can be trapped underground and recovered as natural gas. Landfill gas is an example of biogenic methane. Landfills produce a large amount of natural gas due to the decomposition of the waste materials they contain. Technology has enabled us to contain and harvest the methane gas, recover it as natural gas, and add it to the supply of natural gas.

British Thermal Unit (BTU)

The quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit from 58.5 to 59.5 degrees Fahrenheit under standard pressure of 30 inches of mercury at or near its point of maximum density. One BTU equals 252 calories, (gram), 778 foot-pounds, 1,055 joules or 0.293 watt hours.

Burner Tip

An attachment for a burner head which forms a burner port modified for a specific application. Also, a generic term that refers to the ultimate point of consumption for natural gas.

Carbon Footprint

The impact of human activities on the environment through the burning of fossil fuels or the amount of greenhouse gases individually produced. A carbon footprint is measured in tons of carbon dioxide (CO2).

Commodity

A commodity is a good for which there is demand, but which is supplied without qualitative differentiation across a market. It is fungible, i.e. the same no matter who produces it. Examples are petroleum, notebook paper, milk or copper.

In contrast, one of the characteristics of a commodity good is that its price is determined as a function of its market as a whole. Well-established physical commodities have actively traded spot and derivative markets. Soft commodities are goods that are grown, while hard commodities are the ones that are extracted through mining.

Compressed Natural Gas (CNG)

A fossil fuel substitute for gasoline, diesel or propane fuel. Although its combustion produces greenhouse gases, it is much safer and a more environmentally clean alternative to other fuels. CNG is made by compressing natural gas to less than 1% of the volume it occupies at standard atmospheric pressure. It is stored and distributed in hard containers at 2,900-3,600 psi (pounds per square inch).

Depleted Gas Reservoirs

Depleted reservoirs are formations that have already been tapped of all of their recoverable natural gas. Once the formation has been tapped of all recoverable gas, the structure remains and is geologically capable of holding natural gas. They are attractive storage facilities because their geological attributes are already well known. Depleted reservoirs are usually the most inexpensive storage facilities because the extraction and distribution equipment used in the original production can be used again for storage purposes.

Distribution Expenses

Cost of distributing natural gas from the point of delivery facility to customers.

Distribution System

The distribution system delivers natural gas to cities and towns within a particular area. This is the final step in natural gas delivery to the end user. Distribution involves moving smaller amounts of natural gas at much lower pressures over shorter distances to a larger number of individual customers.

Dry Well

If it is determined that there is not a marketable amount of natural gas present, the well is termed a dry well.

Energy Information Association (EIA)

The statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. EIA is the premier source of energy information for the United States and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government.

Fossil Fuel

Fossil fuels are fuels formed by natural resources such as anaerobic decomposition of buried dead organisms. The age of the organisms and their resulting fossil fuels is typically millions of years, and sometimes exceeds 650 million years. The fossil fuels include coal, petroleum, and natural gas which contain high percentages of carbon. It is generally accepted that fossil fuels formed from the fossilized remains of dead plants and animals by exposure to heat and pressure in the Earth's crust over millions of years.

Gate Station

Generally a location at which natural gas changes ownership, from one party to another, neither of which is the ultimate consumer. It should be noted, however, that the gas may change from one system to another at this point without changing ownership. Also referred to as delivery point.

Gathering System

The gathering system consists of low pressure, low diameter pipelines that transport raw natural gas from the wellhead to the processing plant.

Greenhouse Gases

Greenhouse gases are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The main greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Greenhouse gases greatly affect the temperature of the Earth; without them, Earth's surface would be on average about 59°F colder than at present. The burning of fossil fuels since the beginning of the Industrial Revolution has substantially increased the levels of carbon dioxide in the atmosphere.

Interstate System

The interstate system is made up of high pressure pipelines. The high pressure acts as a propellant to move the natural gas through the pipeline.

Landfill Gas

Landfill gas is an example of biogenic methane. Landfills produce a large amount of natural gas due to the decomposition of the waste materials they contain. Technology has enabled us to contain and harvest the methane gas, recover it as natural gas, and add it to the supply of natural gas.

Liquefied Natural Gas (LNG)

Natural gas that has been liquefied by reducing its temperature to -260°F at atmospheric pressure. It remains a liquid at -116°F. In volume, it occupies 1/600 of that of the vapor at standard conditions.

Mercaptan

Natural gas distributors add a natural, harmless chemical called mercaptan, which gives natural gas its distinctive odor. The odor is added as a way to detect the presence of natural gas or a potential gas leak.

Methane

Methane is the major component of natural gas, about 87% by volume. At room temperature and standard pressure, methane is a colorless, odorless gas; the smell characteristic of natural gas as used in homes is an artificial safety measure caused by the addition of an odorant, often methanethiol or ethanethiol.

Methanogens

Methanogens are tiny methane producing microorganisms that chemically breakdown organic matter to produce methane.

Natural Gas Fuel Cell

Natural gas fuel cells have the ability to generate electricity using electrochemical reactions as opposed to combustion of fossil fuels to generate electricity. A fuel cell works by passing streams of fuel and oxidants over electrodes that are separated by an electrolyte. A chemical reaction is produced that generates electricity without requiring the combustion of fuel or the addition of heat. Fuel cells produce very low levels of harmful emissions and generate high quality, reliable electricity. Fuel cells are completely enclosed units with no moving parts making them safe and quiet to operate. They are efficient because they require less fuel than traditional forms of electric generation using combustion. The generation of electricity has traditionally been an inefficient process that causes pollution.

New York Mercantile Exchange (NYMEX)

The world's largest physical commodity futures exchange, located in New York City. Its two principal divisions are the New York Mercantile Exchange and Commodity Exchange, Inc (COMEX) which were once separate but are now merged. The parent company of the New York Mercantile Exchange, Inc., NYMEX Holdings, Inc. became listed on the New York Stock Exchange on November 17, 2006, under the ticker symbol NMX. On March 17, 2008, Chicago based CME Group signed a definitive agreement to acquire NYMEX Holdings, Inc. for $11.2 billion in cash and stock.

The New York Mercantile Exchange handles billions of dollars worth of energy products, metals, and other commodities being bought and sold on the trading floor and the overnight electronic trading computer systems. The prices quoted for transactions on the exchange are the basis for prices that people pay for various commodities throughout the world.

On-shore Drilling

There are two types of on-shore drilling: percussion or “cable tool” and rotary drilling. Percussion drilling consists of raising and lowering a heavy metal bit into the ground, eventually breaking through the rock to the desired level. Rotary drilling consists of a sharp, rotating metal bit used to drill through the Earth’s crust. The spinning drill bit allows for penetration of the hardest rock.

Percussion drilling is still in use in some of the shallow wells in the Appalachian Basin although rotary drilling is the modern standard.

Off-shore Drilling

There are two types of rigs constructed: moveable and fixed. Moveable rigs are most often used for exploratory purposes because they are much less expensive to construct. Once a large oil or natural gas deposit has been located, a permanent or fixed rig will be constructed and drilling can begin.

Operating Expenses

This is the money a business spends in order to turn inventory into services. Operating expenses also include depreciation of plants and machinery, which are used in the production process.

Outer Continental Shelf (OCS)

The Outer Continental Shelf refers to all submerged lands, its subsoil, and seabed that belong to the United States and are lying seaward and outside of the states' jurisdiction. The United States OCS has been divided into four leasing regions: Gulf of Mexico OCS Region, Atlantic OCS Region, Pacific OCS Region and Alaska OCS Region.

Peak Load Storage Facilities

Peak load storage facilities are intended to meet sudden, short-term demand requirements. These facilities are typically smaller than base load storage facilities and quickly deliver smaller amounts of natural gas. Because they are smaller in size than base load storage facilities, they can be replenished in a shorter amount of time.

Pipeline

All parts of those physical facilities through which gas is moved in transportation, including pipe, valves, and other accessory objects attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.

Productive Well

Once the drilling begins and the presence of natural gas is detected, it is termed a productive well.

Renewable Energy

Renewable energy resources include solar electric, solar thermal, wind, hydropower, geothermal, or ocean current or wave energy resource, biomass resources, including agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, or landfill methane; waste heat derived from a renewable energy resource and used to produce electricity or useful measurable thermal energy at a retail electric customer's facility; or hydrogen derived from a renewable energy resource.

Salt Caverns

Salt caverns are formed from existing salt deposits and can exist in two forms: salt domes and salt beds. Salt domes are formed from natural salt deposits that break through sedimentary layers to form a large dome structure. Generally they are 1,500-6,000 feet below the surface. Salt beds are shallower and thinner formations. They are usually no more than 1,000 feet below the surface and are more prone to deterioration.

Shale Gas

Shale gas is defined as natural gas that is produced from shale formations. Shale acts as the source and reservoir for natural gas. Shales are formed from the mud of very shallow seas that existed over 350 million years ago. It is a very fine-grained sedimentary rock that can easily be broken into thin, parallel layers. Shale can contain a large amount of natural gas, but it can be difficult and expensive to extract. Certain characteristics are required in order for shale to produce gas; it must be rich in organic materials and they must be located in areas where high heat and pressure have converted petroleum to natural gas. The shale must also be brittle and rigid enough to maintain open fractures in order to retrieve the natural gas.

Texican Horizon Energy Marketing

Texican Horizon Energy Marketing is the wholly-owned affiliate of Texican Natural Gas Company that is the largest gas supplier to industrial, commercial and municipal customers in the Carolinas, including the City of Rocky Mount.

Therm

A unit of heating value equivalent to 100,000 British thermal units (Btu).

Thermogenic Process

This theory says fossil fuels are formed when organic matter (such as the remains of a plant or animal) is compressed under the earth at very high pressure for a very long time. Thermogenic methane is formed when organic particles are covered in mud and other sediment. Over time, more sediment, mud and other debris accumulates on top of the organic matter and compresses it. The compression, combined with high temperatures, breaks down the carbon bonds in the organic matter. As you go deeper into the earth's crust, the temperature increases.

Underground Storage Facilities

The utilization of subsurface facilities for storing gas which has been transferred from its original location for the primary purposes of load balancing. The facilities are usually natural geological reservoirs such as depleted oil or gas fields or water-bearing sands sealed on the top by an impermeable cap rock. The facilities may be man-made or natural caverns.

Wellhead

The assembly of fittings, valves, and controls located at the surface and connected to the flow lines, tubing, and casing of the well so as to control the flow from the reservoir.

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Online Sources

The following sources were used throughout the Natural Gas FAQs:

American Gas Association
www.aga.org

American Public Gas Association
www.apga.org

Call 811 – Common Ground Alliance
www.call811.com

Center for Liquefied Natural Gas
www.lngfacts.org

EnergyAnswered.org
http://www.energyanswered.org/

Energy Tomorrow
http://energytomorrow.org/

Federal Energy Regulatory Commission
www.ferc.gov

Geology.com
www.geology.com

HotWater.com
www.hot-water.com

IGS Energy, Inc.
http://www.igsenergy.com

Merriam-Webster
www.merriam-webster.com

National Atlas of the United States
http://nationalatlas.gov

NaturalGas.org
www.naturalgas.org

Natural Gas Vehicles for America
http://www.ngvc.org

Rocky Mount Public Utilities
www.rockymountnc.gov/utilities

SaskEnergy
www.saskenergy.com

Southern Gas Association
www.southerngas.org

Tankless Waters, A Web Stores America Company
www.tanklesswaters.com

Texican Natural Gas Company
www.texican.com

U.S. Energy Information Administration
www.eia.gov

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